FINAL REPORT ON COAL OUTBURST
NO. 2 MINE
CLINCHFIELD COAL CORPORATION
DANTE, RUSSELL COUNTY, VIRGINIA
May 20, 1948

By

Edward Thomas
Mining Engineer

And

William R. Park
Coal-Mine Inspector

Originating Office - Bureau of Mines
Norton, Virginia
W. H. Tomlinson, Engineer-in-Charge

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

TABLE OF CONTENTS

FINAL REPORT ON COAL OUTBURST
NO. 2 MINE
CLINCHFIELD COAL CORPORATION
DANTE, RUSSELL COUNTY, VIRGINIA
May 20, 1948

By

Edward Thomas
Mining Engineer

And

William R. Park
Coal-Mine Inspector

INTRODUCTION

A coal outburst causing the death of six men occurred about 9:00 p.m. on May 20, 1948, in the No. 2 mine of the Clinchfield Coal Corporation, Dante, Virginia.

Eight men were in the face regions of the 19 left section, wherein the outburst occurred; and three other employees were also in the section. The flying coal covered the six men killed and partly covered the other two men in the face region, injuring them slightly. The five live men in the 19 left section escaped without assistance.

The coal outburst or "bump" occurred about 5 minutes after four or five shots of explosives were fired simultaneously in the bottom bench of coal in the No. 2 room. The greater part of the block of coal inby the face of No. 1 room was dislodged and badly shattered.

The Norton office of the Bureau of Mines was notified of the disaster at 2:00 a.m., May 21, 1948, by a telephone message from Mr. J. J. Forbes, Chief, Health and Safety Division, Washington, D. C. Four men from the Norton office left immediately after receiving the telephone message, and arrived at the mine about 3:30 a.m. Rescue operations had been completed, and no one was at the mine when the Bureau personnel arrived. Harold Doctorman, Matthew I. Duncan, William Demkowicz, and William R. Park, Federal coal-mine inspectors, and a group of company officials entered the mine about 7:30 a.m., May 21, 1948, and inspected the affected area. Edward Thomas and A. J. Barry of the College Park, Maryland office of the Bureau of Mines and William R. Park and Matthew I. Duncan of the Norton, Virginia office visited and inspected the affected area May 24, 1948.

GENERAL INFORMATION

The No. 2 mine, owned and operated by the Clinchfield Coal Corporation, is situated along a branch line of the Clinchfield Railroad Company at Dante, Russell County, Virginia. This company also operates several other mines near Dante, Virginia.

The officials of the company are:

A. R. Matthews	President	Dante, Virginia
R. S. Adams	Production Manager	Dante, Virginia
Robert Hughes	Chief Engineer	Dante, Virginia
Smith Williams	Superintendent	Dante, Virginia
Troy Sutherland	Safety Engineer	Dante, Virginia
Oscar Burden	Mine Foreman	Dante, Virginia

The average employment was 277 men, of which number 202 worked underground on 2 shifts. The average daily production was 1,850 tons of coal.

The mine has numerous drift openings at widely separated points, and fans were installed at two of the openings. The underground workings were interconnected with several abandoned mines as well as with the active No. 5 mine of the company.

The Upper Banner bituminous coal bed, which in this mine ranges from 44 to 84 inches in thickness, dips approximately 2 degrees to the northwest and outcrops in ravines indenting the surface area at many places on the property. The coal is rather dull in appearance, fairly firm in structure, and the face and butt cleavage planes are not pronounced. The coal bed normally contains three bands of impurities, which are 1 inch of shale, 1/2-inch of sandstone, and 6 to 18 inches of shale. The latter is 35 inches above the mine floor, and is known as the "middle man." The overburden ranges in thickness from zero at the openings to a maximum of 750 feet and was about 720 feet at the site of the outburst.

The immediate roof in this mine varies from sandstone in some sections to gray shale in others. Where the gray shale is present, it is 8 to 14 inches in thickness. The immediate floor ranged from hard, smooth fire clay to hard shale and to sandstone. The immediate roof in the affected area was massive sandstone, and the floor was well-indurated shale.

The overlying strata, as taken from logs of two boreholes drilled by the company about 2,000 feet from the affected area, are as follows: (The location of these boreholes with respect to the site of the outburst is shown in fig. 1.)

Borehole No. 11

		Depth below surface			Depth below surface
Drift	29'-0"	29'-0"	Sandshale	33'0"	241'-0"
Slates, coal, and shales	23'-0"	52'-0"	Slate and coal	7'5"	248'-5"
Sandstone	13'-0"	65'-0"	Sandshale	11'-7"	260'-0"
Sandstone (Hard)	21'-0"	86'-0"	Sandstone	19'-5"	279'-5"
Sandstone	26'-0"	112'-0"	Coal	0'-7"	280'-0"
Coal and slate	8'-0"	120'-0"	Sandshale	3'-0"	283'-0"
Broken slate and sandstone	10'-0"	130'-0"	Sandstone	58'-0"	341'-0"
Coal	0'-2"	130'-2"	Upper Banner Coal Bed	8'-0"	349'-0"
Slate and sandstone	21'-10"	152'-0"	Sandshale	6'-0"	
Sandstone	29'-0"	181'-0"	Slate and sandstone	10'-0"	
Slate	27'-0"	208'-0"	Sandstone	47'-0"	

Borehole No. 51

		Depth below surface			Depth below surface
Drift	23'-0"	23'-0"	Sandstone	13'-0"	245'-0"
Slate	10'-0"	33'-0"	Coal	0'-6"	245'-6"
Sandshale .	4'-0"	37'-0"	Slate	4'-6"	250'-0"
Sandstone .	41'-0"	78'-0"	Sandstone	50'-2"	300'-2"
Slate	28'-0"	106'-0"	Upper Banner Coal Bed	7'-2"	307'-4"
Sandstone .	47'-0"	153'-0"	Fireclay	0'-8"	308'-0"
Sandshale .	60'-0"	213'-0"	Sandshale	12'-0"	320'-0"
Coal	0'-6"	213'-6"	Sandstone	35'-0"	355'-0"
Sandshale .	18'-6"	232'-0"			

UNDERGROUND MINING METHODS, CONDITIONS, AND EQUIPMENT

The mine was developed by a room-and-pillar method. Main entries were driven in sets of two, three, or four, and cross and room entries were driven in pairs. The distance between cross entries was 1,000 feet, and room entries were driven at 300-foot intervals. Entries were driven 14 to 18 feet in width and rooms 18 to 24 feet in width. Pillars in entries were 35 feet in width, and in rooms 26 to 35 feet in width. Crosscuts were turned at 80-foot intervals. All development work in the mine had been completed, except that two sets of entries, five abreast, were being driven for testing purposes. Recent pillar recovery has been accomplished by driving pockets into the chain pillars, and, where possible, the fenders have been recovered. Generally, no effort was made to establish pillar lines, although the company officials state that the entire chain pillars were being recovered and the good roof breaks were experienced without abnormal difficulties. About 90 percent of the coal was loaded by means of loading machines into shuttle cars, and onto a 600-foot belt conveyor; the remainder was loaded by hand directly into mine cars. In the affected section, coal was loaded by a mobile loader into mine cars.

All coal was undercut or center-cut with shortwall or Arcwall mining machines. The shot holes were drilled with electric hand-held drills. Permissible explosives detonated by means of instantaneous electric detonators were used for all blasting purposes.

A systematic method of timbering had been adopted. Roof conditions were generally good; however, in entries and narrow rooms (18 to 20 feet in width), a row of line posts, set on 4- to 6-foot centers, is required on each side of the tracks. In the wide rooms, one or two additional rows of line timbers are required. Three-piece timber sets are used in some of the rooms and at places along the entries where necessary. The cross bars are set on 2- to 6-foot centers. The timbering rules also require that at least two safety posts be kept in advance of the permanent timbers, in each working place. Suitable cap pieces or wedges are required over all posts. Generally, the company's timbering rules were well followed; however, according to recent inspectors, sufficient timbering was not done in the piller openings cut through to the gobs, and sufficient breaker posts were not used.

Circulation of air in the mine was induced by a centrifugal-type fan and a disk-type fan, both operated exhausting. Seven underground booster fans were also used to help ventilate the mine. The two main fans were installed in fireproof structures on the surface, offset 15 feet from their respective openings. The underground booster fans were driven with open-type motors; the surroundings at three of the fans were not fireproofed; the air-lock doors at the installations had less than 30 square feet cross-sectional area; and the doors would not open automatically when the fans stopped operating. The main air currents were directed through the workings in three separate splits. Generally, main haulageways were in intake air. The main fans were operated continuously, and the installations permitted the reversal of air flow.

More than 6,000 cubic feet of air a minute was reaching the intake ends of the pillar lines, and the working places were ventilated adequately. Air that had passed through abandoned workings and that had been used to ventilate pillar lines was reused to ventilate live workings.

All doors used to control the main air currents were built in pairs to form air locks. Several automatic doors were installed on the main haulageways; the others were operated manually.

Many of the stoppings in crosscuts between the main intake and return airways of the main and cross entries were constructed of wood. Other stoppings along the main and cross entries were constructed of rock, plastered with concrete. Abandoned parts of the mine were not sealed, but were inspected regularly.

The mine is treated as nongassy by the Division of Mines, Virginia Department of Labor and Industry; however, the Bureau of Mines considers this mine gassy because more than 0.25 percent methane was present in some of the air samples collected in open mine workings during the Federal inspections. Preshift examinations of the mine were made, and all underground officials carried permissible flame safety lamps and made examinations for gas in each place visited.

Generally, the mine was dry and dusty throughout, especially in the face regions. Excessive coal-dust accumulations were not present in the mine, and the recent Federal inspection (May 17-20, 1948) shows that the mine was generally well rock-dusted.

Trolley locomotives were used for main and secondary haulage, and combination trolley-and-cable-reel locomotives were used in the face regions. Two shuttle cars and a short belt conveyor were also used to transport some coal for short distances in the face regions.

The underground trolley and feeder wires were well installed and were guarded at all necessary locations.

Twenty permissible flame safety lamps were available at the mine. The lamps were in good condition, and they were used daily by the foremen, fire bosses, and other designated employees at the mine. Permissible electric cap lamps were used for portable illumination by all underground employees and officials.

All underground electric equipment is nonpermissible, but it is generally maintained in good operating condition. The electric equipment, consisting of mining machines, locomotives, hand-held drills, air compressors, loading machines, shuttle cars, conveyor drive motors, pumps, and room-type hoists, was operated in either intake or return air.

Electric power, 275 volts direct current, was used underground. The trolley, feeder, and other power wires were well installed on insulators. Cut-out switches were provided at regular 2,000-foot intervals in the main power circuits and near the beginning of the branch lines. The locomotives and the trailing cables on the cable-reel locomotives were not provided with overload protection; the rest of the electric equipment and trailing cables on the portable equipment were provided with suitable overload protection. The trailing cables were constructed of fire-resistive material, and splices in the cables were well made and well insulated.

Coal and rock in the mechanical sections were blasted on shift with permissible explosives. Blasting in the hand-loading sections was done on the off shift. Generally, all shot holes in a face were fired simultaneously by means of multiple-shot blasting units. All blasting was done by shot firers, and examinations for gas were made immediately before and after blasting.

MINE CONDITIONS IMMEDIATELY PRIOR TO COAL OUTBURST

Work in the affected section (19 left off 12 left) was resumed 4 months ago after a lapse of 22 years. This work was being done to help straighten an old pillar line, and to recover room pillars to the right and left of Nos. 1 and 2 rooms. The Nos. 1 and 2 rooms were being driven through three partly mined pillars of coal, 150 feet wide, that had been left for protection when the inby room and entry pillars were mined in 1926. The company officials reported that the area inby Nos. 1 and 2 rooms was pillared successfully without unusual conditions or trouble.

The two pillar lines shown in Figure 1 had been started during the press for production during the first world war, and in 1926, when the post-war market was more competitive, both pillar lines were abandoned. The barrier pillar had been left to prevent a squeeze which might develop on one pillar line from riding over to the other. At the time of reopening the area 22 years later, it was decided to abandon the pillars to the right of the barrier, because the roof had caved in many places, and to reestablish the pillar line to the left of the barrier.

Reportedly, no unusual conditions were encountered in driving the Nos. 1 and 2 rooms off 19 left until May 20, when several outbursts occurred. Similar blocks of coal throughout the mine had been mined in essentially the same manner, with only the usual "weighting" problems connected with ordinary pillar recovery. However, the fire boss' report on May 19, 1948, stated that "excessive weight in the 19 left section was breaking the top and ribs and breaking timbers on the left." The same man's report of May 20 stated that "excessive weight was breaking the ribs and heavy mountain shots were coming on the 19 left section." The day-shift foreman reported on May 20 that "some loading delays were caused by bumps in the 19 left section." Reportedly, the ribs in Nos. 1 and 2 rooms had been crushing for several days.

About 2:30 p.m., May 20, 1948, a coal outburst or "bump" occurred in the No. 2 room off 19 left while a center cut was being made with an Arcwall mining machine. The mining machine was thrown 15 to 18 feet outby the face, and the cutter bar of the machine was broken in two pieces. Twelve or thirteen cars of coal (the exact number is uncertain) was dislodged (about 40 tons) from the face by the outburst, and one of the machinemen had one or two ribs fractured by the flying coal.

The roof and coal had been "working" considerably before this "bump" occurred, but afterwards quieted and appeared to be static. The day-shift employees moved the loading machine into the No. 2 room and loaded 5 or 6 cars of the dislodged coal before the shift was ended. The general mine foreman and the assistant superintendent were notified of the coal outburst, and they visited and inspected the Nos. 1 and 2 rooms between 4:15 p.m. and 5:00 p.m. They stated that "the roof and coal were working less at the time of inspection than at any time during the week," and that they saw no reason why the night-shift employees could not load coal in these places.

The second-shift employees began their shift at 6:00 p.m. in the No. 2 room, and loaded eight cars of loose coal in this place. These eight cars and the five or six cars of coal loaded by the day-shift employees were dislodged by the "bump" at 2:30 p.m. and by a second "bump" that occurred while the loose coal was being loaded in No. 2 room by the second-shift crew. The second "bump", which occurred about 8:00 p.m., threw about two cars of coal from the face, some of which struck the loading-machine operator and injured his arm slightly.

After the loose coal in the No. 2 room had been loaded, the loading machine was moved to the No. 1 room and four cars (all the empty cars in the face region) were loaded with coal. The loading of these cars (coal crushed from the face) threw an excessive amoung of dust into suspension, which, according to the survivors, caused six men to enter the right crosscut off No. 1 room.

After the loading machine was moved to No. 1 room the shot firer and machineman drilled and prepared four or five shot holes in the bottom bench of coal in the No. 2 room. This bench of bottom coal was left intact by the two coal outbursts; the top bench of coal (above the "middle man") was dislodged to a depth of 6 to 10 feet in the face. Each of the four or five shot holes was charged with four or five cartridges of permissible explosive. The leg wires of the electric detonators were wired in series to fire the charges simultaneously.

The machineman stated that after the charges were prepared for blasting, the shot firer left the face region to visit the explosives-storage boxes, and that he (the machineman) made the final preparations for blasting. The blasting cable extended from the face of No. 2 room through the left crosscut off No. 1 room to near the right rib of No. 1 room. The machineman fired the blast while standing near the right crosscut off No. 1 room. He stated that a third coal outburst occurred within 4 or 5 minutes after the shots were fired and before he had moved from the location where he had fired the blast.

Six employees who (loading-machine operator and helper, two timbermen, a trackman, and a slate picker) were in the right crosscut, were killed. One man (the mining-machine operator who actually fired the shots) was along the right rib and near the right crosscut in No. 1 room. The shot firer was coming through the left crosscut off No. 1 room; the motor crew was returning to the face of No. 1 room with a trip of six empty cars (pushing the cars); and the section foreman was near the telephone (800 feet from the face) when the accident occurred.

The machineman, shot firer, and brakeman from the 19 left section were interviewed by the writers, and their stories of conditions in the affected section prior to the "bump" generally agree. They stated that the roof and coal were "working" considerably and that some of the different crew members had talked about leaving the places before the "bump" occurred at 9:00 p.m. The shot firer and machineman stated that the coal outburst came suddenly without warning.

EXTENT OF OUTBURST

The Nos. 1 and 2 rooms off 19 left off 12 left were being driven through a partly mined block of coal, 300 feet in length and 150 feet in width. The Nos. 1 and 2 rooms (actually Nos. 29 and 30 rooms off 8 left entry) were turned on 60-foot centers, were 24 feet wide near the faces and were driven 208 and 289 feet in depth, respectively, when the outburst occurred. The face of No. 1 room was 6 to 10 feet inby crosscuts to the right and left off No. 1 room. The No. 2 room had been driven about 80 feet inby the face of No. 1 room. Several hundred tons of coal was dislodged; coal was thrown 75 feet outby the face along the No. 1 room tracks; the right crosscut (18 feet wide and 40 feet in depth) was filled with thrown coal; the block of coal inby the original face to probably the 7 left air course (80 to 90 feet) was dislodged; the coal to the right of No. 1 room (40 feet wide) was dislodged and shattered; and the block of coal between Nos. 1 and 2 rooms was dislodged and shattered, especially near the face of No. 2 room. Details are given in figure 4. The loading machine was shoved about 60 feet outby the face, and the end of the loading boom was forced against an offset in the left rib of No. 1 room. The track near the loading machine was twisted and bent; also numerous timbers in the crosscut to the right of No. 1 room and in No. 1 room were dislodged.

The motor crew was returning to the face with a trip of six empty cars (pushing the cars), and the locomotive was 260 feet outby the face of No. 1 room when the outburst occurred. The brakeman, who was riding in the front car, was thrown into the second car by the concussion and the motorman was thrown out of the locomotive. The section foreman, who was near the telephone (800 feet from the face) was not affected by the forces. The shock of the "bump" was heard by the employees in the 19 right off 12 left section, a distance of 2,400 feet.

Officials on the surface were notified of the accident by a telephone message from the foreman of the affected section.

RECOVERY OPERATIONS

The shot firer and machineman (the two men at the face who were injured slightly) were partly covered by the flying coal. The shot firer was able to

free himself, and he helped free the machineman. They were unable to see because of the excessive dust, but were proceeding from the face when they were met by the motorman and brakeman, who were also partly blinded by the excessive dust. These four men, joined by the section foreman, returned to the face of No. 1 room and discovered that the rest of the crew had been covered completely by the dislodged coal. They decided that they should inform company officials on the surface of the accident before attempting to recover the bodies.

Company officials on the surface ordered the five survivors to stay at the telephone until help arrived. The rescue party, under the direction of A. R. Matthews and R. S. Adams, president and production manager of the company, respectively, reached the 19 left section about 10:00 p.m. Some timbering was done along the roadway of No. 1 room as the rescue party advanced to the face. To recover the bodies, members of the rescue party hand-shoveled in teams, for short periods because of the excessive dust. The first body was found near the center of the roadway in No. 1 room and about 15 feet outby the right rib of the right crosscut; the second body was uncovered about 8 feet from and directly opposite the right rib of the right crosscut; and four bodies were found together near the mouth and right rib of the right crosscut off No. 1 room. The six bodies were recovered and removed to the surface by 2:00 a.m., May 21, 1948. The six men apparently had been killed instantly by the flying coal.

Four Federal inspectors, Harold Doctorman, Matthew I. Duncan, William M. Demkowicz, and William R. Park of the Norton office of the Bureau of Mines, arrived at the mine about 3:30 a.m., May 21, 1948. Rescue operations had been completed, and no one was at the mine at that time. The Federal inspectors and a group of company officials entered the mine about 7:30 a.m. and inspected the affected section. The roof and coal in the face regions were "working" considerably during the time the investigating party was in the section.

Edward Thomas and Anthony J. Barry of the College Park office and Matthew I. Duncan and William R. Park of the Norton office of the Bureau of Mines and a group of company officials again inspected the 19 left section on May 24, 1948.

Messrs. Kelly, St. Clair, and Mullins, of the Division of Mines, Virginia Department of Labor and Industry, inspected the affected area on May 24, 1948. An official statement by the Virginia Division of Mines, regarding the outburst, had not been made at the time of writing this report.

Coroners' inquests are not usually held in Virginia when the cause of death is obvious.

CAUSES OF COAL OUTBURSTS

An outburst or "bump" is a spontaneous failure of material resulting from sudden application of release of stresses. The conditions that usually produce outbursts of coal are: (1) A strong roof formation that tends to overhang or cantilever over the goaf for long distances; (2) a coal which is elastic and capable of considerable deformation under restraint without

failure; (3) a floor formation that resists plastic flow, because flow of material from underneath a pillar tends to dissipate stored-up energy; and, (4) a condition, often induced by the mining system, or lack of system, that permits the stored-up energy to be released suddenly. Although many coal outbursts occur where the depth of cover is great, this factor is not necessarily a condition for such occurrences. Records show that violent outbursts have been experienced in as little as 500 feet of cover.

Where roof structures resist caving, it is impossible to prevent storing up elastic energy within the cores of large pillars in the vicinity of pillar lines; therefore, if good mining practice is followed, the pillar line must be retreated in a manner that will permit orderly distribution of stresses and eventual slow dissipation of elastic energy. Experience has shown that such pillar lines can be worked safely in the following manner and deviations are likely to induce outbursts:

1. The extraction of coal during development should not exceed 40 percent of the total, and if feasible to mine less, a greater factor of safety is provided.

2. The pillar line should be as long as possible (1,500 feet minimum). If the depth of cover exceeds 1,500 feet, the pillar line should be at least equal in length.

3. The pillar line should be kept in a straight line, and every effort should be made to get complete extraction. This is very important, the cause of many bumps has been traced to pillar projections into the goaf or to portions of pillars left in the goaf.

4. The pillars should be recovered "open-ended", and only one pillar lift at a time should be driven into the same pillar. If a fender is left next the goaf, its width should be but a few feet so that it will crush readily if left behind in the goaf.

5. Under no circumstances should openings be driven toward the goaf in solid coal within the abutment area. (See figure 3.)

RESULTS OF THE INVESTIGATION

Examination of the face area to the left of the barrier pillar (19 left off 12 left) in which the outburst occurred, revealed evidence that substantial caves had not been made on the main pillar line before it was abandoned in 1926 Inasmuch as this was the only substantial pillar in the area and, together with pillar remnants on 7 left, projected well out into the goaf, it is reasonable to suppose that there was an impingement of stresses on this, the only solid block of coal in the area which was able to bear a great amount of stress without undue crushing. Thus a condition illustrated by figure 3 was present. That is, after the pillar line was abandoned, the weight of the cantilevered strata over the goaf crushed the 7 left pillar remnants and the near end of the large pillar (a) until the restraining action of the failed coal prevented lateral expansion. The convergence of the floor and roof ceased when the core of the pillar resisted further deformation through compression. Thus an equilibrium of stresses was reached at some point within the abutment area and

(b) an enormous amount of elastic energy was stored. When the pillar was being split by driving two openings toward the goaf, one or more coal outbursts were inevitable as soon as the faces reached the critical point in the abutment area where the resistance of the solid coal was insufficient to withstand the pressure being exerted outward from the core of the pillar. As shown in figure 4, the pillar virtually exploded when the restraining material was removed. The forces were outward rather than toward the goaf because the fulcrum of the lever, causing the pressure, was in the goaf and the action was similar so that of a pumpkin seed when squeezed between the thumb and forefinger.

CONCLUSIONS

In the majority of cases, the conditions that produce coal outbursts or "bumps" are controllable. Whenever massive roof strata induce difficulties in obtaining breaks along pillar lines special precautions should be taken toward preventing concentrations of stresses. This is a principle of good mining practice even if coal outbursts are not anticipated. Practices considered as contributing to the disaster at this mine are as follows:

1. The percentage of coal taken on the advance was too great to permit safe and economical withdrawal of pillars under heavy roof.

2. The pillar lines inby the affected area had not been kept in step prior to its abandonment.

3. This large pillar projecting into a partly caved area was being mined by driving two wide openings in the direction of the goaf.

4. A portion of both roadways for 200 feet outby the face measured 45 feet in width and only 16 feet was left in pillars on either side. Such a condition subjected the section to a severe "squeeze" even if a bump was not anticipated, and might have closed the avenue of escape.

Although the present mine officials have not had experience with "bumps" prior to this disaster, company records show that a violent bump occurred in this mine (room 3 pillar off 9 and 10 right off the mains) on October 13, 1936, which killed one man; however, the supervising personnel has been almost entirel replaced since that date, and none of the present supervisors were aware of thi occurrence.

On the date of the disaster, the outburst that killed the six men was the third occurrence within 7 hours. In the first outburst which occurred at 2:30 p.m. on May 20, 40 tons of coal bumped from the face of No. 2 room. These occurrences should have served as a warning that a dangerous condition was impending, and the places should have been stopped for a few days until the cause for the phenomenon could be investigated.

RECOMMENDATIONS

The following recommendations are offered in the belief that the hazard from coal outbursts at this mine will be minimized if compliance is obtained;

1. The mining practices throughout this mine should be examined and practices that could induce outbursts should be eliminated. If similar roof

conditions are found to exist in other mines of this company, mining practices that could induce outbursts should be eliminated.

2. If the pillar line on which this disaster occurred is to be re-established, it should be straightened out before retreating and all pillars should be taken "open-ended" (a thin "shell" fender may be left next the goaf); no slabbing should be done in small pillars to reach the face area with roadways; under no circumstances, should pillars be split by driving toward the goaf or other pressure areas; and rows of breaker posts should be set at points where roof breaks are desirable.

3. To insure good roof breaks, the pillar line should be retreated in a straight and orderly manner, and no pillar remnants should be left in the goaf.

4. To familiarize themselves with the conditions that have resulted in bumps in neighboring fields, the officials of the mine should visit these mines and discuss the problem with the mine officials.

5. Whenever signs of "bumps" are suspected, the men should be withdrawn immediately from the disturbed region.

ACKNOWLEDGEMENT

The writers wish to acknowledge the courtesies extended, and the assistance given, by the officials of the Clinchfield Coal Corporation, particularly Mr. A. R. Matthews, president; Mr. R. S. Adams, production manager; Messrs. Hughes and Parnell, engineering department; Mr. Luther Allen, assistant superintendent; and Mr. Oscar Burden, mine foreman.

The cooperation of Messrs. Kelly, St. Clair, and Mullins of the Division of Mines, Virginia Department of Labor and Industry is also gratefully acknowledged.

Respectfully submitted,

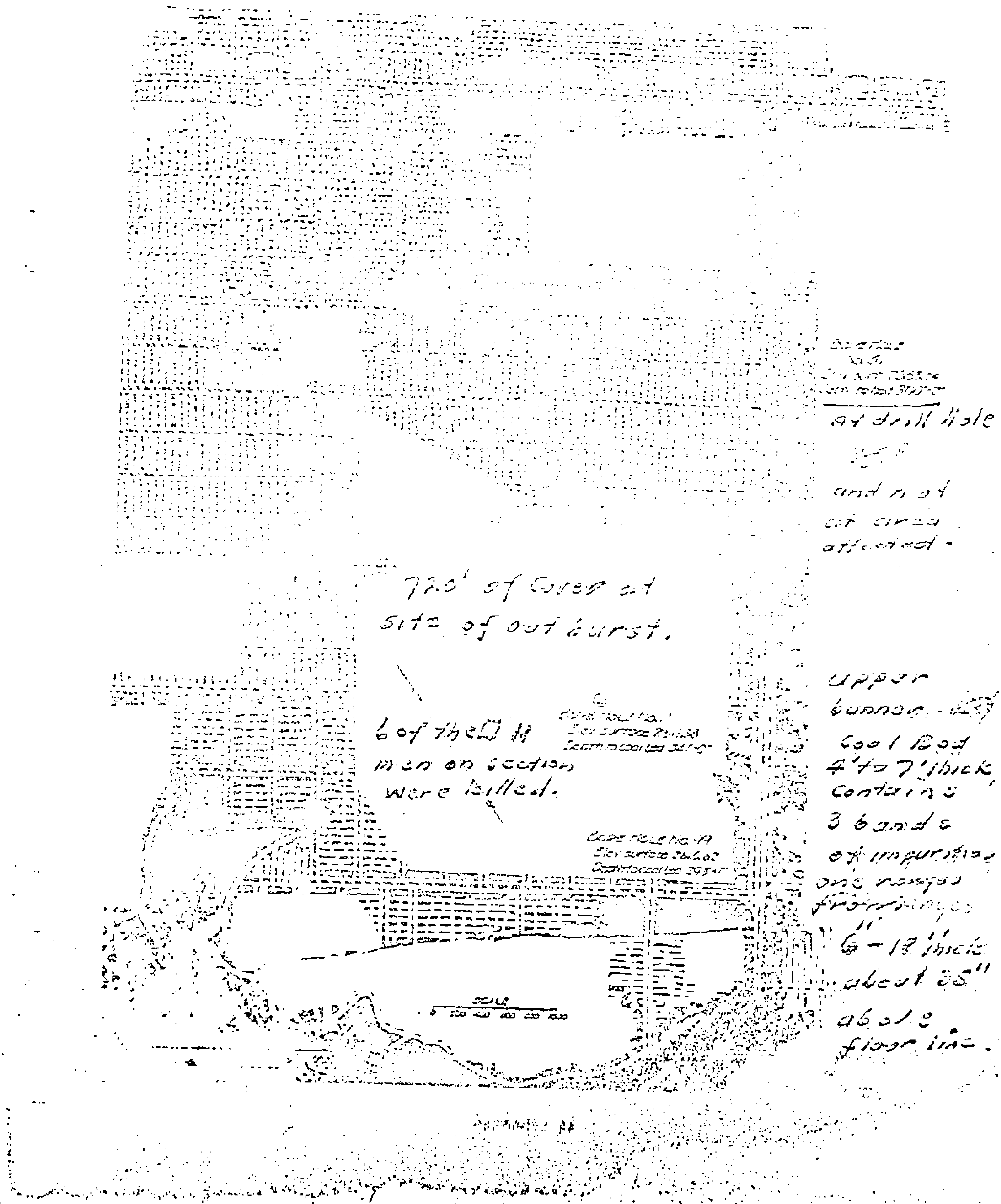
(Signed)
Edward Thomas,
Mining Engineer.

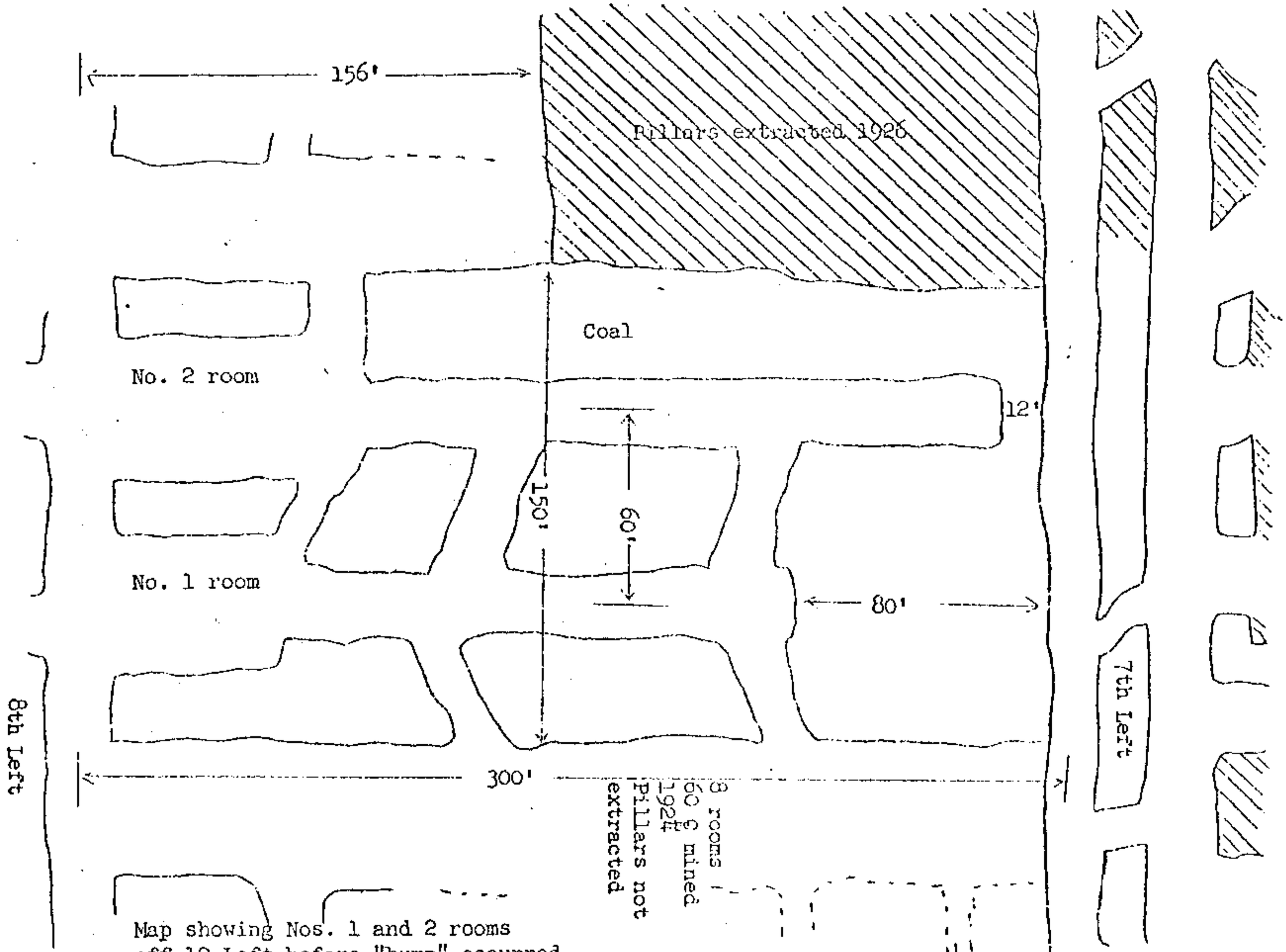
(Signed)
William R. Park
Coal-Mine Inspector.

APPENDIX I

LIST OF DECEASED MEN

Name	Age	Occupation
Uris Artrip	42	Timberman
James Darrell Rasnick	20	Slate Picker
Arnold Vicars	32	Machine Helper
Troy J. Phillips	25	Trackman
Harold Parks	23	Joy Operator
Okley Creger	39	Joy Helper

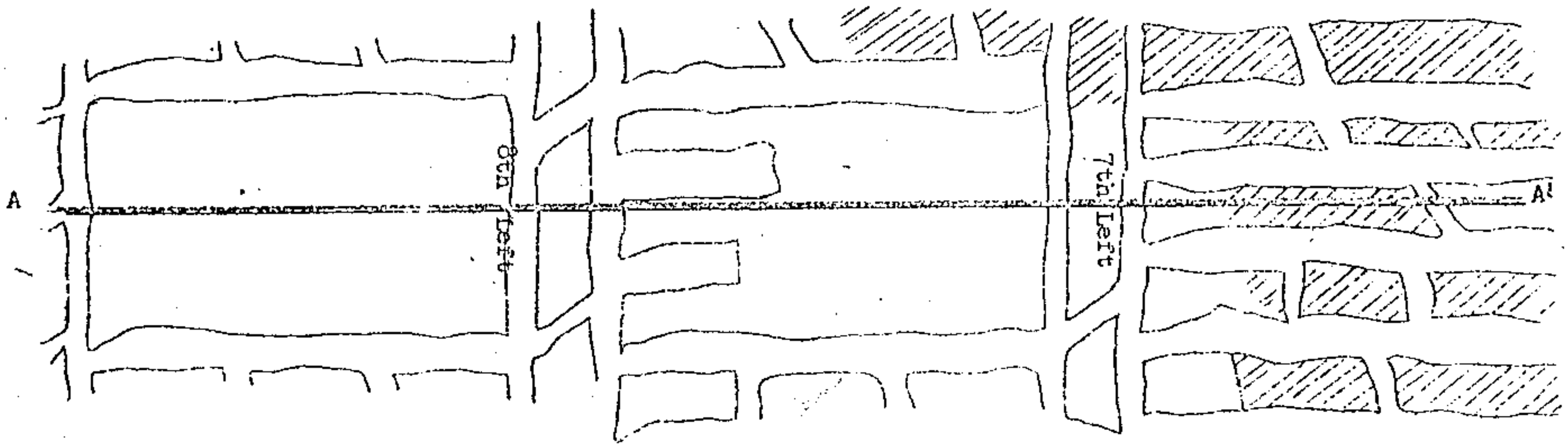

720' of Cover at site of outburst.
6 of the 14 men on section were killed.
at drill hole
and not at area affected -
upper bannock
Coal Bed 4' to 7' thick, contains 3 bands of impurities and ranges from 6" - 12" thick about 35" above floor line.

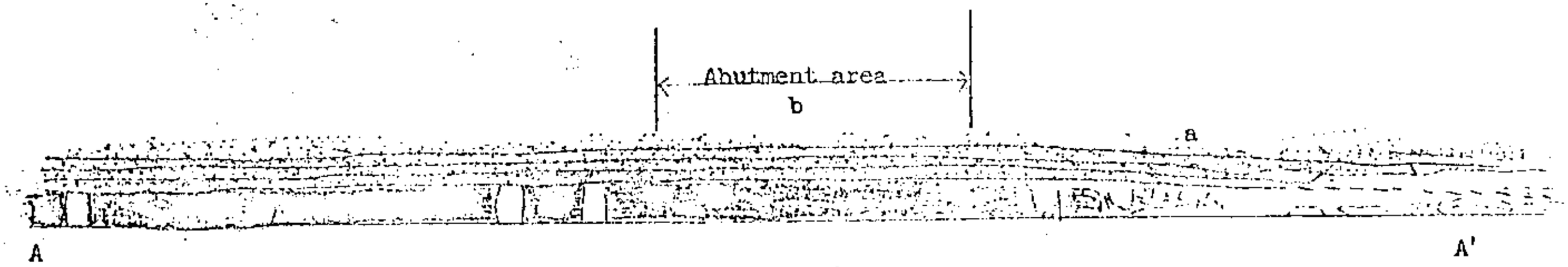


Map showing Nos. 1 and 2 rooms
off 19 Left before "bump" occurred

Appendix III

Approximate scale 1" - 40'

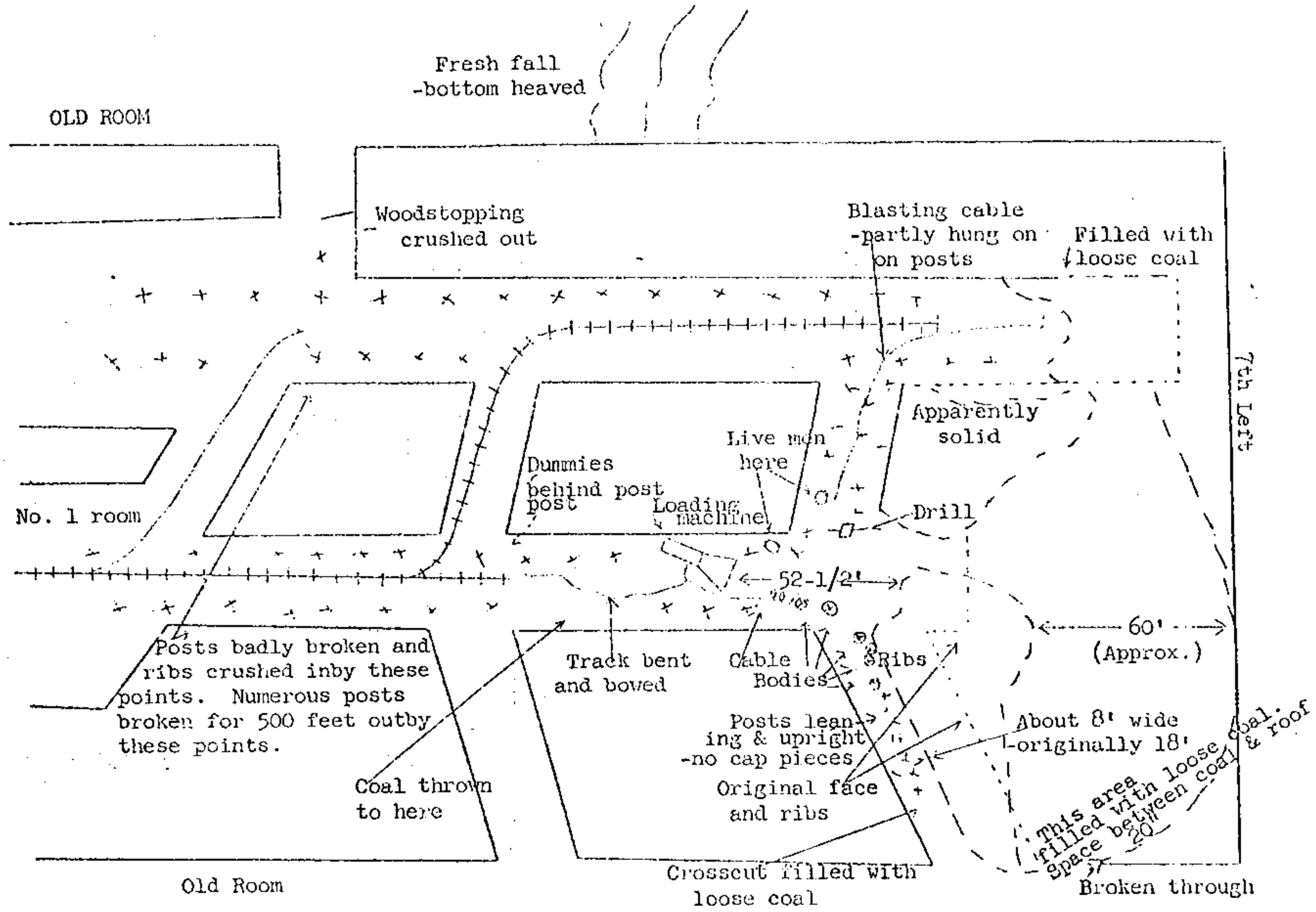




Section on line A-A' showing condition before barrier pillar was mined

Horizontal scale 1" - 100'
No bertical scale

Appendix IV



Appendix V

Sketch showing Nos. 1 and 2 rooms after "bump" occurred

Not drawn to scale

APPENDIX VI

COPY

COMMONWEALTH OF VIRGINIA
Department of Labor and Industry
Richmond

John Hopkins Hall, Jr.
Commissioner

Big Stone Gap, Va.
June 12, 1948

Mr. Edward Thomas, Mining Engineer
Coal Mine Inspection Division
U. S. Bureau of Mines
College Park, Maryland

Dear Mr. Thomas:

I have just gone over the report on the coal outburst, in the #2 Mine at Dante, Virginia on May 20, 1948, submitted by you and Mr. William R. Park, in behalf of the U. S. Bureau of Mines. Your conclusions are practically the same as those of Mr. A. G. St. Clair, Mr. Noah Mullins and myself, as submitted to our Commissioner of Labor, Honorable John Hopkins Hall, Jr.

We agree fully with your recommendations but also recommend that mobile loading units or other systems requiring a grouping of several workmen, in a small area, be done away with, in any section where there is any danger of a bump. If these two places had been driven by hand loaders until the pillar line had been established, there would not have been a disaster.

We appreciate your cooperation in this investigation and your courtesy in submitting this report, for our comments, before publishing it.

With kindest personal regards, I am

Very sincerely yours

(Signed)
C. P. Kelly
Chief Mine Inspector

MOSS #2 MINE BUMP

	(3:41 P.M.) 5-20-72
1st. Bump Occurred	3 Hrs. 41 Min. 35 Sec.
Waves Arrived	3 Hrs. 41 Min. 09 Sec.
Magnitude	4 to 4.2 on Richter Scale.
	(4:05 P.M.)
2nd. Bump Occurred	4 Hrs. 05 Min. 31 Sec.
Magnitude	1 to 1.5 on Richter Scale.

(Longitude ' W 82° 14' 28")

(Latitude N 37° 00' 52")

Per Dr. Bollinger
Prof. of Physics
V.P.I.

These bumps were associated with the CO in Moss #2.

cc: J. H. Justice
J. W. Fleming
H. Kiser
B. Couch
R. Ryland
H. Sproles
Engrg. Dept. File